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FAO Plant Protection Bulletin

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World Reporting Service on Plant Diseases and Pests

Plant Pathology in Colombia

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Although Colombia is situated in the tropics, its mountain system, consisting of three parallel ranges ot the Andes, creates a series of climatic zones, extending from hot regions at sea level to the cold zones of the paramos at altitudes of 3,000 m. or more. The diverse ecological conditions favor the growth of various kinds of plants, making it possible to cultivate tropical crops such as cacao, sugarcane, cotton, rice, etc., and plants of the temperate regions such as cereals and certain fruits. Moreover, in the intermediate climatic zones it is not unusual to find plants of different habitat grown simultaneously. As is to be expected, the diseases of these crops usually pass unnoticed, and only when conditions become favorable for an epiphytotic do they attract the attention of the grower, because of the spectacular damage they might inflict.

Plant Disease Survey

Plant disease surveys have seldom been carried out in Colombia, having been performed more or less systematically only for rice, cacao, potato and wheat, and less intensively for other crops, such as sugarcane, tobacco, cotton, fruits, etc. Through its experiment stations which are devoted exclusively to the study of problems of coffee culture, the National Federation of Coffee Growers has gathered over long years abundant information on the diseases which attack coffee plants. However, there are still obscure points in the etiology of certain diseases, and no definite statement can be made as to the actual importance of each principal disease of this crop. This lack of information on one of the most important aspects of Colombian agriculture is due almost exclusively to the lack of plant pathologists, of whom there are scarcely a half-dozen for this relatively large country with so many different agricultural zones. Another important factor in this respect is the lack of an adequate national plant protection service.

The present knowledge of the plant disease situation in Colombia is largely the result of studying the few samples of diseased plants submitted to the colleges of agriculture and to the experiment stations for identification of the pathogens. Occasionally, the appearance of an acute unhealthy condition in a certain crop has impelled an immediate investigation as to its cause. Nevertheless, with perhaps very rare exceptions, no estimate has been made of the amount of losses caused annually by diseases even in the most important crops.

One of the most important disease hazards and perhaps the first one in the country's history is that of cacao which has been cultivated in Colombia for many centuries. The production of this crop has declined gradually for some years because of disease epidemics. The black pod disease, caused by *Phytophthora faberi* (often considered as a synonym of *P. palmivora*), seems to have appeared first and was responsible for the extinction of many plantations. *Monilia* pod rot, a virulent fungus disease believed to have originated in Ecuador, came next and is now the most destructive plague of cacao in Colombia.

Around 1952 gummosis, caused by *Xanthomonas vasculorum*, wreaked havoc in the

sugar cane plantations, which were then mostly planted to susceptible varieties. The disease was recognized in 1926 by Carlos E. Chardon, who introduced into the country resistant varieties such as B.H. 10/12 and S.C. 12/4, and P.O.J. varieties. In 1933 sugarcane mosaic was recognized, when it was already causing losses running into millions of pesos. Further losses were partially prevented by the use of the P.O.J. varieties which then began to replace the local susceptible varieties.

A similar situation occurred in rice, the extensive cultivation of which started in Colombia in about 1930. By 1935 a serious disease outbreak resulted in tremendous losses to the growers in the Cauca Valley. Investigations made at that time showed that the causes of these losses were *Helminthosporium oryzae* and *Piricularia oryzae* which attacked the rice with great intensity.

Only in recent years has attention been paid to the pathological problem of wheat, consisting principally of the three rusts: *Puccinia graminis tritici*, *P. rubigo–vera tritici* and *P. glumarum*. At present, extensive surveys are being carried out in the Francisco José de Caldas Experiment Station on the severity and amount of damage caused by the rusts in the Sabana of Bogota. Based on the findings of the surveys, a breeding program to improve wheat varieties is now under way.

The potato, which constitutes the basic diet for the vast majority of the Colombian population, is another important crop. Numerous diseases occur in various potato growing regions, but undoubtedly the most important one is late blight which appears very commonly in all regions and at all seasons.

Disease Control

Colombian farmers take scarcely any measures to combat plant diseases. It might be said that, except for potatoes, no other crop receives such attention. But potato growers realize that in order to obtain any yield at all they must spray the plants against late blight. Many different kinds of fungicides have been used for this purpose. Until recently, Bordeaux mixture was the standard fungicide, but later zineb, under the trade name of Dithane Z–78, and copper oxychloride have been in use. The results obtained with different fungicides are extremely variable, depending on local conditions. Nevertheless, it appears that Dithane has gradually become most popular despite its short–term efficacy and high price. Cost is one of the factors which limits the use of fungicides by farmers, inasmuch as the profit obtained from the crop is frequently so little that it becomes impossible to spend money on disease control.

Lack of information on life cycles and the development of diseases under local conditions also increase the difficulty in the application of control measures. There are no established spray programs and for the application of spraying material everything has been used, from the whisk broom to high–precision motorized machinery.

One of the important differences between tropical and temperate countries with respect to disease development is that many pathogens in the temperate regions overwinter in their sexual stage which appears at the end of the season and furnishes the primary inoculum in the spring. In the tropics many of these perfect forms are unknown but asexual reproduction continues throughout the year.

For example, many of the rust fungi produce only the uredial stage, teliospores being unknown. The pycnial and aecial stages of heteroecious rusts are not observed, or perhaps they occur on wild hosts and have not yet been linked up with other stages in their life cycle. On the Colombian species of *Berberis* pycnia and aecia of *Puccinia graminis* are not found, and the possible rôle of teliospores is yet unknown. The same holds good also for *Puccinia sorghi* which produces telia in the cold zones at about 2,600 m. altitude, but does not produce the complementary stages on its alternate host, *Oxalis*, some species of which are common weeds in Colombia.

Another example is found with certain Ascomycetes such as *Venturia inaequalis*, the cause of apple scab, whose perithecia have not yet been observed on old infected leaves. Perithecia of Erysiphales have not been seen either, and it is likely that they are not developed, not even at higher altitudes. Although the conidial stage of *Sclerotinia* spp.

is common, only a few species were found to form apothecia in culture. It is possible that either the absence of a winter season inhibits the development of the sexual stage, or else the genetic factors for their formation have been lost through disuse. On the other hand, there are in Colombia many ascosporic forms of fungi belonging to many genera.

To sum up, the lack of adequate knowledge on the life cycles of the pathogenic fungi, together with the climatic conditions which favour the continuous production of inoculum, doubly handicaps any efforts at controlling plant diseases in Colombia.

Legislative Measures

Although there exists in Colombia practically all the legislation necessary to protect adequately the agricultural industry, many of the provisions are not enforced, either due to lack of facilities for their effective application, or through negligence. Colombia's Plant Protection Service is scarcely developed as yet and only functions in urgent cases. Its staff has been reduced at present to one chief and one assistant. The basic plant quarantine legislation consists of two laws and three presidential decrees as follows:

Law 74 of 30 November 1926 authorizes the issuance of regulations by the Government concerning agricultural defense and sanitation and provides such regulations with the character of regulations governing police and public health, which make them enforceable. It also establishes penalties for contravention and specifies the authority empowered to impose such penalties.

Law 203 of 30 November 1938 is practically identical with the above. It regulates further the way in which contributions in money or material should be made for control campaigns. It also indicates the agencies and persons with whom the Government may negotiate for entrusting phytosanitary activities and provides the inclusion in the annual budget of appropriations necessary to cover expenses.

The three decrees, i. e. No. 1128 of 1931, and Nos. 1008 and 1538 of 1939, regulate the activities of the Plant Protection Service at the ports and frontiers, prescribe the phytosanitary certificate required for the introduction of plants and plant products, and establish the entry requirements.

It is prohibited to import into Colombia, plants, propagating material and seeds of coffee as well as those of other rubiaceous plants; used coffee sacks; unroasted cacao; and sugarcane and orchids from Africa.

Common Plant Diseases

With such records as are available at present, a more or less exhaustive list of crop diseases occurring in Colombia could be compiled, but it will not be attempted here. The following list, covering only the most important diseases affecting crops of economic value, will give an idea of the disease situation in the country and also provide a basis for future reports.

Rice (*Oryza sativa*)

Helminthosporium blight – *Helminthosporium oryzae* Breda de Haan
Cercospora spot – *Cercospora oryzae* Miyake
Blast – *Piricularia oryzae* Cav.
False smut – *Ustilaginoidea virens* (Cke.) Tak.

Sugarcane (*Saccharum officinarum*)

Mosaic – *Saccharum* virus 1
Gummosis – *Xanthomonas vasculorum* (Cobb) Dowson
Red rot – *Colletotrichum falcatum* Went
Ring spot – *Leptosphaeria sacchari* Breda de Haan
Pineapple disease – *Ceratostomella paradoxa* (De Seynes) Dade (= *Thielaviopsis ethaceticus* Went)

Cacao (*Theobroma cacao*)

Witch's broom disease – *Marasmius perniciosus* Stah.
Black pod disease – *Phytophthora faberi* Maubl.
Diplodia pod rot – *Diplodia theobromae* (Pat.) Taub.
Monilia pod rot – *Monilia roreri* Cif.
Anthracnose – *Colletotrichum theobromicola* Del.
Root canker – *Rosellinia* spp.

Coconut (*Cocos nucifera*)

"Porroca" – cause unknown, similar to little leaf
Bud rot – *Phytophthora palmivora* Butl.

Cotton (*Gossypium* spp.)

Anthracnose – *Glomerella gossypii* Edg.
Wilt – *Fusarium oxysporum* f. *vasinfectum* (Atk.) Snyder & Hansen
Angular Leaf spot – *Xanthomonas malvacearum* (E. F. Sm.) Dowson.
Rhizoctonia rot – *Rhizoctonia* sp.

Maize (*Zea mays*)

Leaf spot – *Helminthosporium turcicum* Pass., and others
Smut – *Ustilago maydis* (DC.) Cda.
Gibberella rots – *Gibberella* sp.
Diplodia rots – *Diplodia zeae* (Schw.) Lév.
Leaf rust – *Puccinia sorghi* Schw.
Rust – *P. pallescens* Arth.
Brown spot – *Physoderma zeae-maydis* Shaw
Black spot – *Phyllachora maydis* Maubl.

Tobacco (*Nicotiana tabacum*)

Wildfire – *Pseudomonas tabaci* (Wolf & Foster) Stevens
Blackfire – *P. angulata* (Fromme & Murray) Holland
Mosaic – viruses
Black shank – *Phytophthora parasitica* var. *nicotianae* (Breda de Haan) Tucker
Frenching – cause uncertain
Leaf spot – *Cercospora nicotianae* Ell. & Ev.

Beans (*Phaseolus vulgaris*)

Rust – *Uromyces appendiculatus* (Pers.) Fr.
Anthracnose – *Colletotrichum lindemuthianum* (Sacc. & Magn.) Br. & Cav.
Root rot – *Rhizoctonia solani* Kühn; *Fusarium* spp.; *Macrophomina phaseoli* (Maubl.) Ashby; *Sclerotium* spp.
Angular leaf spot – *Isariopsis griseola* Sacc.
Mosaic – viruses
Bacterial blights – *Pseudomonas medicaginis* Sackett f. sp.; *P. phaseolicola* (Burk.) Dowson

Potato (*Solanum tuberosum* subsp. *andigenum*)

Late blight – *Phytophthora infestans* (Mont.) D By.
Rhizoctonia disease – *Rhizoctonia solani* Kühn
Powdery scab – *Spongospora subterranea* (Wallr.) Lagerh.
Common scab – *Streptomyces scabies* (Thaxt.) Waks. & Henrici
Slime disease – *Rosellinia* sp.
Brown rot – *Pseudomonas solanacearum* E. F. Sm.
"Buba" – *Thecaphora solani* Barrus.
Root knot – *Heterodera marioni* (Cornu) Goodey
Powdery mildew – *Oidium* sp.
Blackleg – *Erwinia carotovora* (Jones) Holland.
Rust – *Puccinia pittieriana* P. Henn.
Early blight – *Alternaria solani* (Ell. & Martin) Jones & Grout
Sclerotinia rot – *Sclerotinia sclerotiorum* (Lib.) D By.
Gray mold – *Botrytis* spp.
Mosaic – virus
Purple top – virus
Haywire – virus
Vein yellowing – virus
Aucuba mosaic – virus
Yellow dwarf – virus (on a few plants originated from imported seeds)

Banana (*Musa sapientum*)

Sigatoka – *Cercospora musae* Zimm.
Panama disease – *Fusarium oxysporum* var. *cubense* (E. F. Sm.) Wollenw.
Cordana leaf spot – *Cordana* sp.

Plantain (*Musa paradisiaca*)

Streak – cause unknown
Sigatoka – *Cercospora musae* Zimm.
Bacterial wilt – *Xanthomonas solanacearum* (E. F. Sm.) Dowson

Wheat

Stripe rust – *Puccinia glumarum* (Schm.) Eriks. & Henn.
Stem rust – *P. graminis tritici* Eriks. & Henn.
Leaf rust – *P. rubigo-vera tritici* (Eriks.) Carl.
Leaf blotch – *Septoria* sp.

Control of Olive Fly in Israel [1]

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IN Israel the olive fly (*Dacus oleae*) is a major hazard in olive cultivation but its control is still an unsolved problem.

There are approximately 150,000 dunams (1 dunam = 1,000 square meters) of olive groves in Israel. The variety most commonly grown is Souri, a late variety used principally for oil extraction. Among the early varieties, the more common ones are Merhavia, Manzanillo, Ascollano and Sevillano, which are used for pickling. Pickling varieties are usually grown on the coast and become infested by the olive fly as early as the end of May. By the end of June, the infestation in some cases may reach as high as 90 percent. The injured fruits fall to the ground and wither. At harvest, during August and September, 20 to 100 percent of the fruits remaining on the tree are usually infested.

Field control of the olive fly was begun in 1925 when the Berlese method, consisting of spraying the trees with a poisoned bait known as Dachicida, was recommended to the growers by F. S. Bodenheimer. Since then, systematic observations have been carried out every year throughout the country to determine the intensity of the olive fly infestation and its fluctuation in various localities. The Berlese method had not been popular with the olive growers in Israel, owing to the fact that its efficiency could not be established and the bait caused severe injuries to fruit and leaves under local conditions.

Experiments with Bait Sprays

The first series of experiments for the control of olive fly were carried out during 1940 to 1944 for the purpose of testing the bait sprays as used in the Berlese method. The Italian insecticidal preparation, Dachicida, was compared with other bait formulations, using 2 ½ parts of sodium arsenite in combination with the following:

1. 95 parts of sugarbeet molasses and water;
2. 10 parts of sugar and water;
3. 10 parts of sugar, 5 parts of ammonia sulphate and water.

The stock preparations were diluted into two concentrations, 7 percent and 10 percent, for spraying. Three to six treatments were applied according to the olive variety, locality and fluctuation in insect population.

By examining the results of the five-year experiments, it was not possible to reach any conclusion as to the efficiency of any one of the bait formulations used in combating olive fly.

During 1951 and 1952, a new series of experiments were made after receiving information from Greece of successful control of olive fly by using a modification of the Berlese method. These experiments were based upon the following principles:

1. The whole area of an isolated olive plantation should be treated.
2. The bait solution should be sprayed from the ground underneath the tree in order thoroughly to cover the lower surfaces of the foliage, at the rate of about 500 cc. for each tree.
3. The timing of the treatments should be based upon the fluctuation of fly population, as determined by counting every five days the fly catches in the traps distributed in the grove. During each rise of population a treatment should be given.

The experiments were carried out in an isolated olive grove about 15 km. from the sea shore, which was known to be heavily infested during the previous years. Six treatments were given from May until the beginning of August.

On examination of the fruits during the normal harvest time it was found that all

[1] Presented at the FAO Conference on Olive Fly, Florence, 16–21 March 1953.

were completely free from fly injury. This was quite remarkable, considering that during the summer of 1951 the olive fly was prevalent throughout the country causing considerable damage. In the untreated olive groves at a distance of about 10 to 12 km. east and west of the experimental plot, 90 to 100 percent of the fruits were injured by the fly. Similar experiments carried out in 1952 using the same method and in the same olive grove gave equally satisfactory results.

Experiments with Bait Traps

Control of olive fly by using bait traps was reported to be quite successful in Spain. This method was tested in 1951, using three to ten traps for each olive tree with 4 percent aqueous solution of diammonium phosphate as the attractant. The traps were set at the beginning of May, about two weeks before the first infestation appeared. The result of these tests indicated that there was no reduction in olive fruit injury by using such traps.

Experiments with Cover Sprays and Dusts

With the availability of new synthetic organic insecticides, large scale experiments for controlling olive fly were initiated in 1945 in different parts of the country. DDT, BHC as well as arsenate and a proprietary cryolite (Cryocide), were used at various concentrations as dusts and sprays, and at intervals of two to four weeks. These experiments, which were continued for three years, yielded inconsistent results, although DDT appeared to show promise. It was therefore decided to carry out experiments with DDT alone in order to compare the efficiency of various formulations and various methods of application.

In 1949, DDT was applied by power ground machinery, using three formulations, i. e. 5 percent dust, 25 percent emulsion and 50 percent wettable powder, at the respective rate of 15 gm., 25 gm. and 50 gm. active ingredient per tree per treatment. Five treatments were given in an olive grove planted with the late variety Souri from the middle of June to shortly before the normal harvest time, which started on 5 September. An examination of the fruit injury made on 7 September indicated that in spite of the slight differences in the rate of infestation between the treated and non-treated plots, DDT in any formulation used did not give significant reduction in olive fly infestation. Moreover, there was no marked difference between the three formulations in efficacy. On 4 October, about 90 to 100 percent of the fruits were found to be infested in both treated and non-treated plants.

In 1950, DDT in 5 percent dust was applied by airplane and by Buffalo turbine. The airplane dusting was carried out in an isolated olive grove of early varieties of Ascollano and Merhavia, about 13 km. east of Tel-Aviv. Four treatments were given between 28 June and 17 August at the rate of 4 kg. dust per dunam. The first examination was made on 16 August when harvesting started, and the second examination twelve days later. The results indicated that the treatments failed to give satisfactory protection of the fruit against the olive fly.

During the same year a similar trial was carried out with a Buffalo turbine of high velocity in an olive grove about 15 km. north of the one treated by airplane. The results were equally unsatisfactory.

Experiments with Combined Treatments

In view of the unsatisfactory results of previous trials, experiments in olive fly control were started in 1951 from a different approach using cover spray and bait in combination. Wettable powder of methoxychlor (50 percent), dieldrin (25 percent) and DDT (50 percent) were used in the preparation of the sprays, to which 2 percent sugar beet molasses was added as a bait. The experiments were carried out in an olive grove of about 180 trees situated in the coastal zone, planted with three early varieties, Ascollano, Merhavia and Manzanillo, and the late variety, Souri.

The grove was divided into two lots, in order to provide replication. Each of the two lots was further divided into four approximately equal plots of 18 to 24 trees, one remaining non-treated as check and three others each receiving a different insecticide. Every tree was thoroughly sprayed from

the inside and outside with 20 liters of the spraying material in each treatment, containing 50 gm. of active ingredient of methoxychlor or DDT, or 15 gm. of dieldrin. Methoxychlor and DDT were applied in four treatments between 6 June and 17 August, but dieldrin only in three treatments between 6 June and 27 July in order to avoid residual effects. These were applied by a Bean motor sprayer.

The fruits were examined on 28 to 30 August for fly injury. The number of scorched fruits due to the use of molasses was also recorded.

Table 1. – *Results of combined treatments of cover sprays and baits for the control of olive fly, 1951.*

Lot. No.	Variety	Treatment	Percentage of fruits		
			Infested	Clean	Scorched
I	Merhavia	Methoxychlor	4.0	96.0	17.0
		DDT	10.6	89.4	15.7
		Dieldrin	6.2	93.8	18.2
		Check	53.2	46.8	0.0
	Souri	Methoxychlor	6.0	94.0	4.0
		Dieldrin	7.1	92.9	3.7
		Check	19.0	81.0	0.0
	Ascollano	DDT	14.5	85.5	3.7
		Check	40.0	60.0	0.0
II	Merhavia	Methoxychlor	9.1	90.9	8.6
		DDT	16.2	83.8	11.7
		Dieldrin	10.1	89.9	11.4
		Check	54.1	45.9	0.0
	Souri	Methoxychlor	7.4	92.6	5.5
		Dieldrin	4.4	95.6	6.4
		Check	24.5	75.5	0.0

From the results summarized in Table 1, it is obvious that treatments with methoxychlor and dieldrin plus molasses did protect the olive fruits from fly infestation and more than 90 percent of the fruits were uninjured. The differences between the treated and non–treated plots were more significant in the early variety, Merhavia, which is usually more heavily attacked by olive fly early in the season.

From the economical point of view, such treatments are quite expensive, amounting up to six Israeli pounds, equivalent to six U. S. dollars per dunam. Under local conditions, however, such expenses seem to be justified where early pickling varieties of high productivity are involved.

Summary

The control of olive fly is an important but unsolved problem in olive cultivation in Israel. Based upon experiments carried out from 1940 to 1951, there are evidently two methods which have given promising results and provide a basis for future studies.

The first is to follow the Berlese method of using bait sprays wherever an entire area of olive trees can be treated according to the fluctuation of the fly population.

The second is to use cover sprays with methoxychlor or dieldrin, with or without the addition of sweetened material as an attractant. This method is most desirable when early olive varieties are involved or where the treatment of an entire area of olive trees is impractical.

Plant Disease Situation in the United States

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Peanut Yellows Associated with a Ring Nematode

IN September 1950, severe chlorosis was noticed on peanuts (*Arachis hypogaea*) in central east Georgia. In some fields the chlorosis was so pronounced as to resemble, from a distance, a field of yellow-flowering crotalaria in bloom, an appearance quite unlike the rusty, yellowish and mottled look associated with root-knot nematode (*Meloidogyne* sp.) injury.

Species of *Pratylenchus*, *Criconemoides*, and *Helicotylenchus* were found in and on root samples. Great numbers of *Criconemoides* were obtained.

Late in August 1951 this evenly bright chlorosis was observed in other fields. Part of a field in Laurens County, referred to as " terrace " was selected for study. The soil is a sandy loam. The " yellow " or chlorotic part of this terrace was 35 rows wide and 150 yards long; it had a two-year rotation of maize and blue lupine since peanuts were last grown. The " green " part of the terrace was 90 rows wide, with a fair stand; peanuts had been grown in this part for several successive years.

The field was staked in such a way as to give two locations on the green part for each four on the yellow, the arrangement being repeated four times, with staked rows 50 feet apart. On 5 September samples were lifted from each of three rows next to each stake and the adhering soil combined as one sample. After screening and mixing, samples each containing 600 ml. of soil were processed by the Baermann technique. A total of 8,735 specimens of *Criconemoides* was obtained from the 16 soil samples from the yellow locations, or an average of 546 per location. Only 126 specimens of *Criconemoides* were obtained from the 8 samples from the green locations, averaging 15.8 per location. This is a ratio of 34.6 to 1.

On 25 September single plant samples were collected at each staked location and processed in the same way. At this time 983 specimens of *Criconemoides* were found in the yellow samples and 77 in the green, the ratio being 12.7 to 1, somewhat smaller than before.

Similar collections were made on the same date in two more Laurens County fields and in one in Jefferson County. All the 25 September collections, including the original " terrace," resulted in 9,033 specimens of *Criconemoides* from 40 yellow samples, and 437 from 20 green samples, a ratio of more than 19 to 1.

Counts were made of other kinds of nematodes encountered in the sampling, but differences in the numbers found could not be correlated with the chlorosis of peanuts.

Other factors may be involved, but the study indicates a major association of *Criconemoides* with peanut yellows.

Powdery Mildew on Lettuce in California

Powdery mildew (*Erysiphe cichoracearum* DC.) was found on cultivated lettuce (*Lactuca sativa*) in California for the first time in 1940, in the Salinas Valley, which is one of the most important lettuce-growing sections. It was not observed again until 1951, when it reappeared in the same section. The disease is noteworthy because of its sudden appearance both times, and its disappearance between 1940 and 1951.

Only the conidial stage was ever found in those years, although perithecia were searched for and are not uncommon on the wild species, *Lactuca scariola*. The fungus on wild lettuce has been shown not to infect

ordinary varieties of cultivated lettuce. The field occurrence reported in 1950 was limited to a hybrid between wild and cultivated lettuce planted in an experimental plot and was probably due to the biological race or races of the fungus naturally occurring on wild lettuce.

On the other hand, circumstances of the outbreak in 1951 indicate the development of an entirely new biological race adapted to the common commercial varieties of cultivated lettuce. The disease was first observed in August. Distribution and severity seemed to reach a peak in October and the disease was present as late as November. Reduction in yield and quality caused some concern.

Symptoms were characteristic of the powdery mildews. An affected lettuce field could be detected at a distance by its dusty, off–color appearance due both to the sporulating fungus and the yellowing and browning of diseased leaves. A striking result of the infection was the fungus odor, discernible several feet away from the fields as well as when walking through them; the odor was also perceptible at packing sheds when lettuce from infected fields was received for trimming and packing.

Lettuce that was nearly mature at the time of infection was not appreciably damaged since affected outer and cap leaves were easily removed. Early infection, however, reduced size after trimming so greatly that in some cases it did not pay to harvest the heads. Two growers reported that they obtained only two–thirds of their expected yield, and another abandoned his field because of severe scorching that had followed the mildew.

The variety principally affected was Great Lakes. All of the commercial plantings maturing at the time of the outbreak were of this variety.

With this background, the reappearance of powdery mildew in the same districts in October 1952 is of special interest. This time perithecia were found, in abundance, on the Great Lakes variety. The appearance of the fungus in two consecutive years and the development of perithecia in the second year suggests that a race, or races, pathogenic to cultivated lettuce, has arisen in the area. The yearly occurrence and the formation of perithecia also indicate that powdery mildew may become more frequent and important than heretofore.

There is evidence that powdery mildew is rare in other lettuce–growing sections in the United States, as well as in California, and it has been suggested that in some instances the downy mildew disease (*Bremia lactucae* Regel) may have been reported as powdery mildew.

Outbreaks and New Records

Canada

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Powdery Mildew on Cucumbers under Glass and its Control

POWDERY mildew (*Erysiphe cichoracearum* DC.) has been prevalent in recent years on the fall crop of cucumbers grown under glass in Essex County, Ontario, where its presence has been a limiting factor in production. The industry is an important one as some 130 acres are under glass, representing a capital investment of about $ 15,000,000. Sulphur has been used to control the disease and losses are light if the affected plants are dusted on the first appearance of the disease. However, the cucumber plant is relatively intolerant to sulphur when the crop is growing under winter conditions, even though it is fairly tolerant when grown as a spring or summer crop.

Experiments conducted by C. D. McKeen at Harrow, Ontario, have shown that powdery mildew on greenhouse cucumbers may be controlled by spraying regularly and thoroughly with copper sulphate, ½ to 1 pound in 100 gallons of water, or Iscothan (dinitro–capryl phenyl crotonate), 6 to 8 ounces in 100 gallons of water. Five applications of the latter at intervals of 5 to 7 days completely eradicated the fungus. The spray may be applied with any sprayer that will provide thorough coverage of foliage. A pressure of 150 to 200 pounds per square inch at the nozzle is desirable.

Chile

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Alfalfa Wilt in the Andean Zone

This disease, caused by *Corynebacterium insidiosum* (McCull.) Jensen, was recognized in alfalfa fields in the Andean zone, affecting the variety Provence. It is believed that the disease is widespread throughout this area, extending to La Calera, west of Santiago. Among the methods for controlling this disease recommended by the Ministry of Agriculture, the principal one is the use of resistant varieties. It was first planned to import the wilt–resistant varieties Buffalo and Ranger, but later the Department of Agricultural Research obtained from California seeds of the new variety Caliverde, which was developed recently by crossing. This variety possesses wilt resistance derived from the Turkestan group and resistance to other important diseases obtained through selection in California Common which was introduced from Chile during the last century. All seeds obtained will be multiplied for distribution to the growers.

Losses of Wheat Due to Take-all

This disease, due to the fungus *Gaeumannomyces graminis* (Sacc.) v. Arx & Olivier (= *Ophiobolus graminis* Sacc.), is known to have existed for a long time in this country. It produced epidemics of unusual severity during the last two growing seasons in the Province of Cautin which is one of the most

important wheat growing regions in Chile. It is calculated that in the 1951–52 season the disease caused a reduction of 15 percent of the total production in this Province, which amounted to 138,400 metric tons. Thus the loss due to this disease approximated to 20,760 metric tons. In order to find the most proper methods of control, experiments have been initiated including the use of fertilizers, rotations, etc., in the Experimental Stations at Trianon, Osorno and Aconcagua.

Variation in Apple Canker Fungus

Apple canker is one of the most serious diseases in apple orchards in the southern part of the country. Recent studies revealed the existence of two races in its pathogen, *Nectria galligena* Bres. Race A from Osorno, which is the more virulent one, produces creamy yellow stromata and conidia with one to three transverse septations. Both its macro– and microconidia are smaller than those of Race B from San Clemente. The latter has lemon–yellow stromata and its conidia are 3–5 septate. The differences in morphology and pathogenicity between the two races will probably require ultimate splitting of the species.

New Race of Bean Anthracnose

Bean anthracnose, although relatively scarce in the principal bean–growing areas in Chile, is a serious disease in a few localities where high atmospheric humidity prevails, such as La Cruz, Quillota, Limache, and others. Recent studies have shown that there is probably only one race of the causal fungus, *Colletotrichum lindemuthianum* (Sacc & Magn.) Br. & Cav., in the country. This race appears to be different from all the three races, *alpha*, *beta* and *gamma*, previously recognized in other countries. The Chilean bean varieties, Arroz and Cristal, and the introduced varieties, Red Kidney and Michelite, are apparently immune to this local race.

Sclerotinia Disease of Sunflower

Sunflower is the principal oil crop in Chile, occupying approximately 50,000 hectares with a total annual seed production of 70,000 metric tons and oil production of 23,300,000 liters approximately. In recent years sunflower wilt caused by *Sclerotinia sclerotiorum* (Lib.) D By. has caused very heavy losses. The disease appears in two forms: head rot due to infection from ascospores carried by wind, and a general wilt and stem– and root rot caused by the inoculum present in the infested soil or with contaminated seed. The latter is the more severe and common form of the disease.

Experimental evidence has been found that the pathogen advances through the soil producing initial infection in the rootlets. Control measures include principally the selection of non–infested soil as the planting site and the use of certified seed. Among the fungicides proved effective for destroying the mycelial fragments which cling to the seeds are ethyl mercury chloride (Ceresan) and mercuric acetate (Meracet).

Fiji

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First Record of Rhinoceros Beetle

An important pest of coconut palms, *Oryctes rhinoceros* Ol., has been discovered in the foreshore of a village in Suva harbour, according to a cable received from the Fiji Department of Agriculture, 10 March 1953. Only one adult female was found at first. Further investigation reveals, however, a rather light infestation extending for about eight miles along the coast just west of Suva. The Government has been asked to finance operations for its eradication.

Simmonds [1] summarizes the distribution of this pest and mentions that it was accidentally introduced into Western Samoa in 1910. In 1926, Keppel's Island in the Tongan group was affected but the pest was eradicated by 1930. Later, Wallis Island, some 200 miles to the west of Samoa, has become infested. According to Simmonds, unless its numbers in Samoa can be greatly reduced there seems little doubt that it will eventually reach all those groups of islands having commercial relations with the affected areas.

Recently, Dumbleton [2] reported that the beetle was discovered in Neiafu, the port of Vavau, in the Tongan group, in February 1952. Prompt action was taken by the Tongan Government and the Diseases of Plants (Amendment) Regulations 1952 were gazetted on 31 March bringing Vavau under the regulations previously made to deal with the Keppel's Island outbreak. At present three or four square miles of the forty square miles of the island are known to be infested and a soundly based eradication campaign was promptly instituted. The success of this will depend on the efficient organisation of the field work and the conscientious work of the labour supervisors. The relatively small infested area is topographically adapted for restricting further spread and in the light of previous experience on Keppel's Island, the resources which have been mobilised make complete eradication a practical possibility.

Netherlands New Guinea

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In the middle of 1952 a survey of plant pests was carried out throughout Netherlands New Guinea, as a part of a project initiated by the South Pacific Commission. During this survey many destructive pests occurring on economic plants were recorded. Among them, the following may be mentioned.

Coconut palm was found to be attacked by *Sexava coriacea* L., *Aleurodiscus destructor* Mackie, *Oryctes rhinoceros* Ol., *Artona catoxantha* Hamps., and the endemic species, *Rhynchophorus papuanus* Kirsch. The major insects on rice were *Scirpophaga innotata* Walker, *Nymphula depunctalis* Guen., *Cnaphalocrocis medinalis* Guen., and *Leptocorisa* sp. The widespread root borer, *Cosmopolites sordidus* Germ. is the principal pest of bananas. On maize, in addition to the European corn borer and army worm mentioned in the following paragraphs, *Heliothis armigera* Hübn. and *Agrotis* sp. were observed. Citrus was damaged by *Phyllocnistis citrella* Stain., *Prays endocarpa* Meyr., and several coccids.

Among vegetables, beans were infested by *Melanagromyza phaseoli* Coq., *Etiella zinckenella* Treit., and *Brachyplatys* sp. The pests commonly found on crucifers and cucurbits and solanaceous crops included *Nezara viridula* L., *Dacus pedestris* Bezzi, *Prodenia litura* Fabr., *Ceratia* sp., *Epilachna* sp. and *Agrotis* sp. *Plutella maculipennis* Curtis and *Crocidolomia binotalis* Zell. are injurious specifically to crucifers, and the root–knot nematode, *Heterodera marioni* (Cornu) Goodey to tomatoes and eggplants.

The following notes summarize the situation of certain insect pests and plant diseases in the months of November and December 1952.

European Corn Borer

Pyrausta nubilalis Hübn. was observed on maize in the native gardens of the district of Nimboran and in the Island of Japen, causing limited damage. It also infested maize reserves in the Research Centre, Kota Nica. The loss of yield was estimated at 30–40 percent. Spraying with DDT or BHC is not remunerative, as the price of maize is rather low. Efforts will be made to intro-

[1] Simmonds, H. W. Biological control of the Rhinoceros beetle (*Oryctes rhinoceros* L.), 1939. Bull. Dept. Agr. Fiji 21. 1941.

[2] Dumbleton, L. J. Rhinoceros beetle in the Kingdom of Tonga. A report on a visit to Vavau in August 1952. South Pacific Commission Tech. Paper 34. 1952.

duce a maize-less period of two to three months and a practice of burning all stalks immediately after harvest. The measures are expected to be sufficient to reduce the damage of the borer to a negligible amount.

Armyworm on Maize

Leucania loreyi Dup., an army worm, was in evidence on maize in the district of Hollandia, causing scarcely any harm. The plants were infested only in a young stage, about 30–50 days after sowing.

Amaranthus Weevil

Livus sp. was reported to cause galls on the stalks of the cultivated species (*Amaranthus tricolor* and *A. hybridus*) and wild species (*A. spinosus*) of amaranths at Hollmafin near Sarmi. Although infection amounted to 40–60 per cent, damage was limited because amaranth is harvested in a very young stage.

Stem Rot of Cabbage

In the second half of November 1952, a soft rot of cabbage of undetermined cause was reported from the Research Centre, Kota Nica, near Hollandia, causing a dark blue–purple, slimy stem rot with an offensive smell. The disease occurred sporadically in the cabbage reserves in a wet period, and disappeared completely in the following two weeks with less rainfall.

Singapore

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Discovery of Onion Leaf Miner

IN July 1952, specimens of a leaf miner collected from a small vegetable plot at the Naval Base at Singapore, which was said to be causing serious damage to shallots, were sent to the Commonwealth Institute of Entomology for determination. These were identified as *Dizygomyza cepae* Hering, a species that has hitherto only been recorded from Germany, Austria, U.S.S.R., and Japan.

The Senior Entomologist, Federation of Malaya, reports that, as a result of this determination, a survey has been carried out to determine the extent of the infestation before embarking on control measures. The pest has now been found to be so widely distributed in Singapore Island that it will not be possible to eradicate it. The best possible control measures are being sought with a view to putting these into operation as a regular routine. In the meantime it is considered that a survey of onion growing areas in south Johore should be carried out immediately and that, pending the results of this survey, every effort should be made to prevent onions, shallots, chives and related plants from entering the Federation of Malaya from Singapore.

PLANT QUARANTINE ANNOUNCEMENTS

France (Overseas Territories)

1. *Imports of coffee into territories free from coffee rust.*

Order of 3 February 1953, published in the Journal Officiel Vol. 85, No. 62, 13 March 1953, regulates the importation of coffee plants and other potential carriers of *Hemileia vastatrix* into the following French Overseas Territories which are declared to be free from *H. vastatrix*, i. e., French West Africa, with the exception of Dahomey; French possessions in Oceania: Tahiti, Mooréa, Huahiné, Tahaa and Bora–Bora.

The importation, circulation, storage and transit is prohibited in these territories of coffee plants, parts of plants, fresh or dry coffee beans, propagating materials, and also soil, compost and packing materials which have been used for the transportation of such, originating in countries where either the presence of *H. vastatrix* has been observed, or the importation of the above–mentioned products is not prohibited or not subject to phytopathological control. These countries include all countries in Asia and Africa, and New Caledonia.

An exception is made for propagating materials of coffee for the purpose of sowing, which may be permitted entry into the declared territories under special authorization by the Governor or Governor General and after disinfection. For seedlings, berries and seeds of coffee, the authorization can only be given for entry through ports designated by the local administration, and can be accorded only after inspection showing that the products are free from parasites and appear healthy.

Shipments which do not conform to the prescribed conditions shall be refused entry or seized and destroyed.

From countries other than those to which the prohibition applies, the importation, circulation, storage and transit of the above–mentioned products can be authorized only upon presentation of a certificate issued by the competent authority of the exporting country, attesting that the products originated from a country where *H. vastatrix* has not been observed or where the importation of such products is prohibited or regulated. The certificate must be visaed by the administrative authority in the French territory or by the French consular agencies in foreign countries.

This Order abrogates all previous contradictory dispositions on the same subject, especially the Orders of 19 May 1924 and 3 May 1949, issued by the Minister of Overseas Territories.

2. *Imports into Réunion.*

Decrees of 26 February 1953, published in the Journal Officiel Vol. 85, No. 55, 5 March 1953, regulate the importation into the Department of Réunion of banana, sugarcane, coffee and cassava. The provisions of these four Decrees are as follows:

(a) *Banana seedlings.* Importation from any country is subject to the presentation of a phytosanitary certificate issued by the competent official service of the country of origin, attesting in particular that the seedlings all originated from fields inspected and free from Panama disease (*Fusarium oxysporum* Schlecht).

(b) *Sugarcane cuttings, seedlings and seeds.* Importation from any country is prohibited. Material imported for scientific research or experimental purposes may be exempted from this prohibition by the Minister of Agriculture and must be accompanied by a phytosanitary certificate. The certificate should attest that the products originated exclusively from fields inspected and situated in a region free from virus diseases, and that the materials have been disinfected. In case the country of origin is infested by *Clemora* (*Phytalus*) *smithi* Arr., the certificate should also indicate that the products are free from this insect.

(c) *Coffee seedlings, berries, parchment seeds, and unroasted pulped beans.* Importation from any country requires a phytosanitary certificate, attesting that the products originated from fields inspected and free from coffee berry borer, *Stephenoderes coffeae* Hag. (= *S. hampei* Ferr.). In case the country of origin is infested by this insect, the certificate should indicate that the products have been disinfested.

(d) *Cassava cuttings, seedlings, roots and seeds.* Importation from any country requires a phytosanitary certificate attesting that the products originated exclusively from fields inspected and free from virus diseases.

India

Notification No. F. 6–17/52 of 12 January 1953, issued by the Ministry of Food and Agriculture, amends Notification No. 1581 of 1 October 1931 regulating the importation of American or West Indies cotton. This amendment provides that if the shipment is to be imported through Bombay, the consignee shall furnish the required

information about the shipment, not less than 10 to 14 days before arrival, to the Collector of Customs and the Quarantine Entomologist, Directorate of Plant Protection, Quarantine and Storage, Yusuf Building, Bombay, instead of the Secretary, Indian Central Cotton Committee, as required previously.

If the shipment is destined for Madras, the same information shall be supplied to the Traffic Manager of the Madras Port Trust and, in addition, to the Entomologist, the Harbour, Madras. This is a result of shifting the responsibility of fumigating American cotton at Bombay from the Indian Central Cotton Committee to the Directorate of Plant Protection, Quarantine and Storage.

Netherlands New Guinea

Decree of 8 January 1953 (No. 1–Alg.–53–3) revokes all previous decrees originating from the Ordinance of 27 September 1926. It contains essentially the same provisions as the Decree of 19 December 1951, except for a modification of the scale of inspection charges, and that Manokwari and Merauke, in addition to Hollandia, Sorong and Biak, have been designated as the places where the importation of living plant material will be licenced.

Shipments of living plant material intended for importation should be accompanied by a certificate, issued by governmental authorities of the country of origin, stating the species and quantities and certifying freedom from plant pests and diseases. In the certificates for the following plant materials, references to certain specific pests or conditions should be included.

(*a*) Potatoes, indicating freedom from black wart (*Synchytrium endobioticum*) and that the disease does not occur within 500 meters of the growing plot.

(*b*) Hevea rubber seeds, plants and parts of plants certifying that the growing trees are free from *Dothidella ulei* and *Phytophthora* leaf diseases and that the estates where the trees have been grown have never imported material from countries where the said diseases occur.

(*c*) Cacao, stating that in the country of origin neither witches broom disease (*Marasmius perniciosus*) nor swollen shoot disease has been recorded.

(*d*) *Musa* spp., stating that in the country of origin neither Panama disease (*Fusarium oxysporum*) nor bunchy top has been recorded.

(*e*) *Saccharum* spp., stating that in the country of origin neither gum disease (*Xanthomonas vasculorum*) nor mosaic disease has been recorded.

(*f*) *Citrus* spp., stating that in the country of origin neither *Pseudomonas citri* nor quick decline disease (tristeza) has been recorded.

(*g*) Pineapples, stating that in the country of origin neither pineapple wilt nor pineapple weevil has been recorded.

(*h*) Rice (*Oryza* spp.), stating that in the country of origin neither bacterial blight (*Xanthomonas oryzae*) nor yellow dwarf has been recorded.

(*i*) *Cocos* spp., certifying that the material has been fumigated before shipment.

(*j*) Fruits originating in other countries but processed in the Netherlands, accompanied by a certificate issued by the official of the Phytopathological Service in Wageningen.

(*k*) Plant material imported via Singapore, accompanied by a health certificate issued by the Consulate General of the Netherlands in Singapore.

Plant materials which are not subject to the restrictions mentioned above, include:

(*a*) Seeds of vegetables, pot–herbs, fruits, medicinal herbs and ornamental plants, belonging to 164 designated genera.

(*b*) Vegetables, bulbous and tuberous plants (with the exception of potatoes), roots and rhizomes intended for consumption or medicinal purposes.

(*c*) Nursery stock of scallion and garlic.

(*d*) Dry fruits or parts thereof intended for consumption or medicinal uses.

United Kingdom

The Importation of Plants (Amendment) Order, 1953, coming into operation 1 March 1953, provides new restrictions on the landing in England or Wales of lettuce grown in Europe, in substitution of the requirements for the entry of all raw vegetables specified in the Importation of Plants Order of 1947. For imports from Europe south of Latitude 46° N. during the period 1 March to 15 October in any year, a Colorado beetle certificate, as set out in the Third Schedule to the Importation of Plants Order of 1947, is required. For imports from Europe north of latitude 46° N. during the month of March, a certificate of origin is required and during the period 1 April to 15 October a Colorado beetle certificate is required. The previous requirements relating to lettuce imported from countries outside Europe have been re–enacted in the present Order.

The Importation of Lettuce from Southern France (General Licence) Order, 1953 relaxed for the month of March 1953 the requirements mentioned above relating to the importation of lettuce from France south of latitude 46° N. by permitting a certificate of origin to be given instead of a Colorado beetle certificate. This Order, however, was revoked 15 March 1953 owing to the discovery of Colorado beetle in the lettuce imported into England from southern France.

NEWS AND NOTES

First International Congress for Plant Protection

The First International Congress for Plant Protection, organized by the International Confederation of Technical Agriculturists and the International Centre for Plant Protection, will be held 19–23 October 1953 at Naples, with its closing session at the Agricultural Exhibition in Rome. This Congress will have broader coverage than the International Conference for the Examination of Methods of Combating Plant Parasites, which was convened by the same agencies in October 1950, in Rome.

The subjects to be covered are as follows:

1. The requirements of agriculture in relation to the plant protection industry.
2. Technique of the use of plant protection products.
3. Positive results of plant protection.
4. Promotion of plant protection by means of education and publicity.
5. Other questions concerning new discoveries and problems in connection with plant protection.

Among the officers of the Congress, Dr. E. Feisst serves as the President of the International Organizing Committee, and Prof. C. Santini and Prof. C. Sibilia as the Honorary President and President, respectively, of the Italian Organizing Committee. Until 15 September all correspondence concerning the Congress should be addressed to the General Secretariat of the C. I. Antiparasitaires, Beethovenstrasse 24, Zurich, Switzerland.

United Kingdom and Colonies Co-operate with the World Reporting Service

The FAO National Committee for the United Kingdom has arranged that the governmental agencies on plant protection in the United Kingdom, as well as the Governments of Colonial Territories, will cooperate with FAO in promoting the World Reporting Service on Plant Diseases and Pests. The Colonial Territories which have already expressed their desire to collaborate are as follows:

Bahamas, Barbados, Bermuda, North Borneo, British Guiana, British Honduras, Brunei, Cyprus, Falkland Islands, Fiji, Gambia, Gold Coast, Hong Kong, Jamaica, Kenya, Leeward Islands (Antigua St. Kitts–Nevis and Montserrat), Federation of Malaya, Mauritius, Nigeria, Northern Rhodesia, Nyasaland, Sarawak, Seychelles, Sierra Leone, Singapore, Somaliland, Tanganyika, Trinidad, Uganda, Virgin Islands, Windward Islands (Dominica, Grenada, St. Lucia and St. Vincent) and Zanzibar.

Reports from the Colonial Territories to the World Reporting Service will be canalised through the Commonwealth Institute of Entomology and the Commonwealth Mycological Institute. The Directors of these two Institutes, Dr. W. J. Hall and Dr. S.P. Wiltshire, have recently visited Rome to advise FAO in this regard.

Vth International Symposium on Phytopharmacy

The Fifth International Symposium on Phytopharmacy will take place on 5 May 1953 at the Institute of Agronomy, Ghent, Belgium. It will provide an occasion for reviewing recent progress in the field of phytopharmacy and effecting a link between research and practice. The Organizing Committee, with the collaboration of specialists in Germany, England, Belgium, and the Netherlands, has made a great effort to achieve success for this fifth session.

The Symposium will be opened by a speech of welcome by Prof. Ing. J. Van den Brande, the President, which will be followed by communications and discussions on specific subjects. Any enquiries about the Symposium should be directed to the President of the Organizing Committee, Institut Agronomique de l'Etat, Coupure Gauche, 233, Ghent.

Roma - Tipografia del Senato del dott. Giovanni Bardi

CEREAL BREEDING PROCEDURES

This recently published FAO Development Paper covers the whole field from the hybridization of the parent plants until a new variety is in commercial production. Methods of growing hybrid populations, systems of testing and recording of results, variety purification and increase of pure seed, as well as the analysis of data, are treated in detail. Various types of nurseries are described for the breeding of varieties resistant to plant diseases and insect pests, and tolerant to certain climatic factors such as frost.

Special features of the publication are the sixteen appendices which graphically illustrate planting plans, plot arrangements, the statistical progress of a cross, variety purification and other features of a cereal breeding program. The complexity involved in modern plant breeding methods and the consequent necessity of systematizing the procedures are clearly and impressively indicated. 122 pages, $ 1.25; 6 s 3 d.

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